

## SAUDI ARABIAN OIL COMPANY

<b>REVISION CERTIFICATE</b>	<b>EDSD</b>	<b>VERIFICATION</b>	<b>CONTROL NUMBER</b>
	THIS INDICATES THAT REV. NO. <u>0F2</u>	FOR ALL	BY: _____
APPROVAL/CERTIFICATION REQUIREMENTS, BY DRAWING COMPLETION CERTIFICATE (DOC) NO.			

MECHANICAL DATA SHEET FOR  
LOW PRESSURE PRODUCTION TRAP LPPT  
(A81-D-0001, A82-D-0001)  
ZULUF ONSHORE OIL FACILITIES  
ZAFANIYA

DISCIPLINE  
ENGINEER  
S. SASAKI  
DATE: 10-Sep-23

PROJECT  
ENGINEER  
T. MINE  
DATE: 10-Sep-23

CERTIFIED  
K. OGAWA  
DATE: 10-Sep-23

CONSTRUCTION  
AGENCY  
DATE:  
OPERATIONS  
DATE:

JGC JOB NO.	0-8887-20-0000	
JGC DOC. NO.	SD-8100-13513-0001	
UNIT	8100	
ISSUE PURPOSE	FOR CONSTRUCTION	
PREP'D	CHK'D	APP'D
E.P	G.E	S.S
<b>JGC CORPORATION</b>		

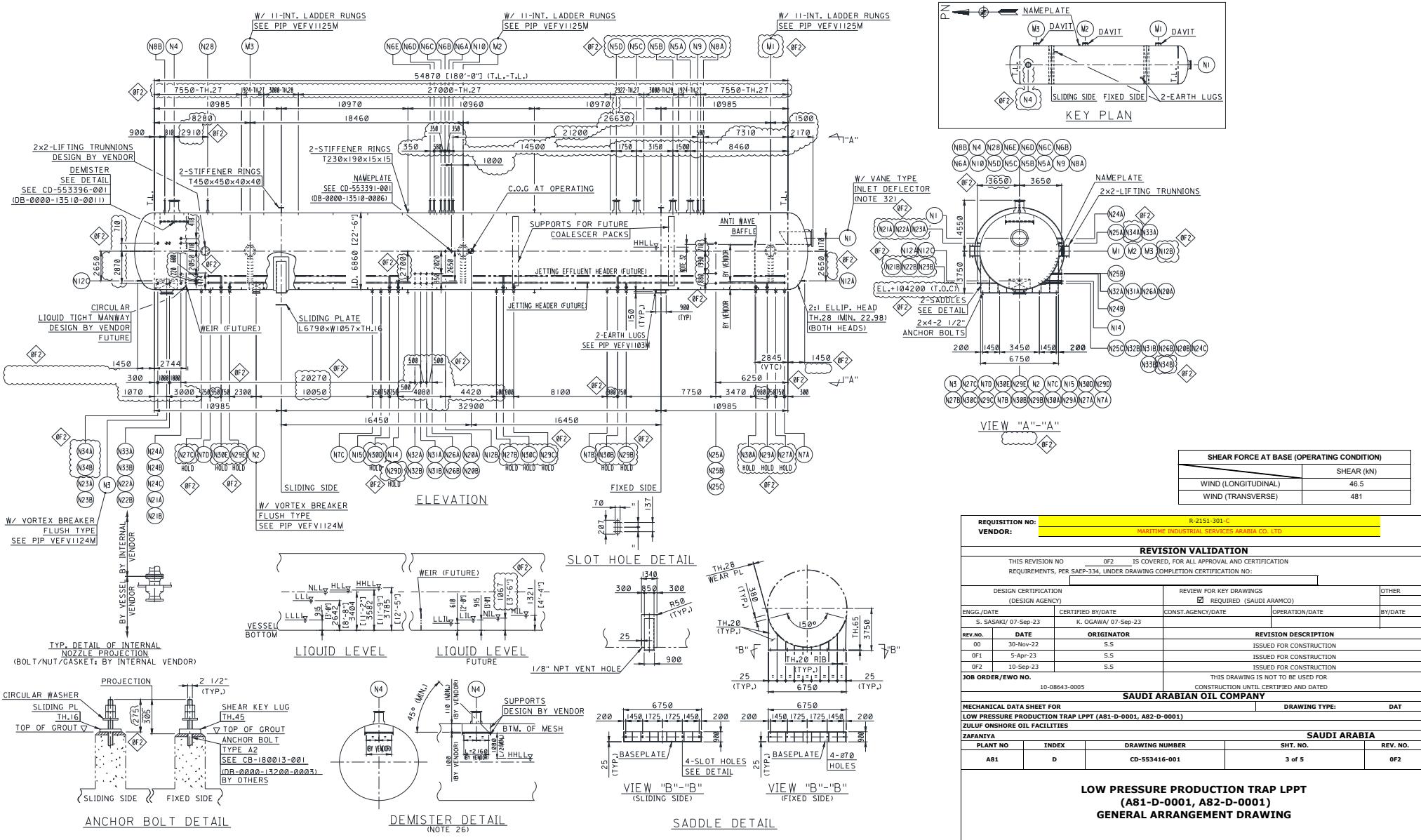
DWG TYPE	PLANT NO.	INDEX	DRAWING NO.	SHT NO.	REV NO.
<b>DAT</b>	<b>A81</b>	<b>D</b>	<b>CD-553416-001</b>	<b>1 OF 5</b>	<b>0F2</b>

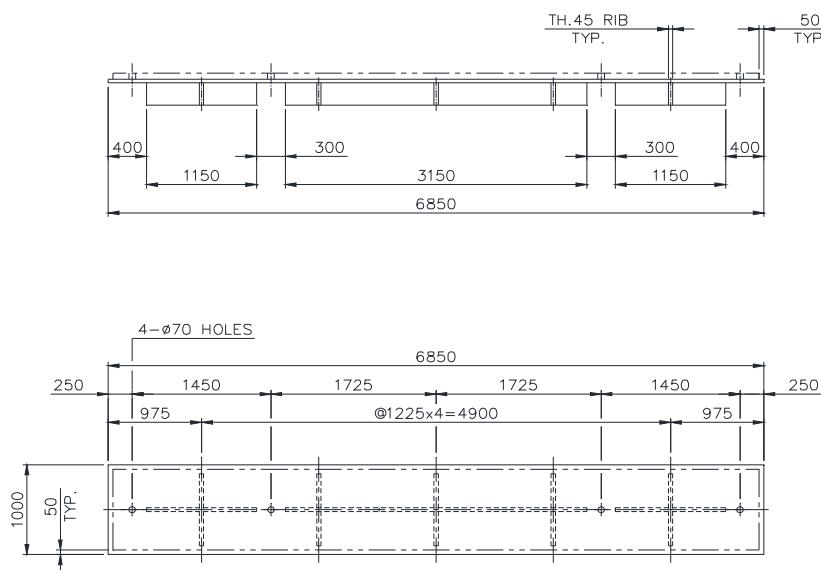
SEE GENERAL ARRANGEMENT DRAWING ON SHEET 3 and 4 OF 5TWO (2) QUANTITY IS REQUIRED: A81-D-0001 & A82-D-0001

NOZZLE & MANWAY SCHEDULE							
MARK	QTY	SIZE	SERVICE	ASME CLASS	FACE TO CL. (mm)	REMARKS	
N1	1	48"	FEED	150# RFSRW	SEE DWG	B16.47 SERIES A	
N2	1	20"	WATER OUT	150# RFSRW	3760		
N3	1	36"	EMULSION OUTLET	150# RFSRW	3820	B16.47 SERIES A	
N4	1	30"	VAPOR OUTLET	150# RFSRW	SEE DWG	B16.47 SERIES A	
N5 A/B/C/D	6	16"	PZV	150# RFSRW	SEE DWG		
N6A/B/C/D/E	5	3"	PR. TRANSMITTER	300# RFSRW	SEE DWG		
N7 A/B/C/D	4	4"	CLOSED DRAIN	150# RFSRW	3670		
N8 A/B	2	2"	VENT LINE	150# RFLW	SEE DWG		
N9	1	3"	VENT TO FLARE	150# RFSRW	SEE DWG		
N10	1	4"	VENT LINE	150# RFSRW	SEE DWG		
N12 A/B/C	3	2"	STEAM OUT	150# RFLW	SEE DWG		
N14	1	6"	FUTURE PUMP RECYCLE	300# RFSRW	SEE DWG		
N15	1	3"	ANODE MONITORING	150# RFSRW	3670	NOTE 56, W/ BLIND FLANGE	
N20 A/B	2	3"	LEVEL TRANSMITTER (FUTURE)	300# RFSRW	SEE DWG		
N21 A/B	2	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
N22 A/B	2	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
N23 A/B	2	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
N24 A/B/C	3	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
N25 A/B/C	3	2"	INTERFACE LEVEL / LEVEL TRANSMITTER	300# RFLW	SEE DWG		
N26 A/B	2	3"	SPARE	300# RFSRW	SEE DWG	W/ BLIND FLANGE	
N27 A/B/C	3	3"	ANODE MONITORING	150# RFSRW	3670	NOTE 56, W/ BLIND FLANGE	
N28	1	3"	PDIT	300# RFSRW	SEE DWG		
N29A/B/C/D/E	5	4"	JETTING NOZZLES	150# RFSRW	3670	NOTE 56	
N30A/B/C/D/E	5	4"	JETTING EFFLUENT NOZZLES	150# RFSRW	3670	NOTE 56	
N31A/B	2	3"	LEVEL TRANSMITTER (FUTURE)	300# RFSRW	SEE DWG	with blind flange for N31A/B and N32A/B	
N32A/B	2	3"	LEVEL TRANSMITTER (FUTURE)	300# RFSRW	SEE DWG		
N33A/B	2	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
N34A/B	2	3"	LEVEL TRANSMITTER	300# RFSRW	SEE DWG		
M1/2/3	3	30"	MANWAY	150# RFSRW	3770	B16.47 SERIES A, W/ BLIND FLANGE & DAVIT	

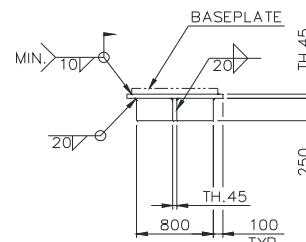
OPERATING CONDITIONS		MATERIALS OF CONSTRUCTION (Note 19)		INSULATION FIREPROOFING & PAINTING		REQUISITION NO:	
INTERNAL PRESSURE:	NORMAL: 50 (344.74) psig(kPa)	COMPONENT:	ASME NO:	INSULATION THICKNESS:	N/A	R-2151-301-C	
	MAXIMUM: 90 (620.53) psig(kPa)	SHELL:		FIREPROOFING THICKNESS:	N/A	VENDOR: MARITIME INDUSTRIAL SERVICES ARABIA CO. LTD	
EXTERNAL PRESSURE:	NORMAL: psig(kPa)	- BASE MATERIAL	SA 516 Gr. 70N HIC	SHOP PRIME & PAINT:	(Note 3)	REVISION VALIDATION	
	MAXIMUM: psig(kPa)	- CLADDING OR OVERLAY	N/A	(SAPCS NO):	N/A	THIS REVISION NO OF2 IS COVERED, FOR ALL APPROVAL AND CERTIFICATION REQUIREMENTS, PER SAEP-334, UNDER DRAWING COMPLETION CERTIFICATION NO:	
SERVICE:	(Note 55)	BOOT:		FIELD PRIME & PAINT:	N/A	DESIGN CERTIFICATION (DESIGN AGENCY)	
If other (Specify):		- BASE MATERIAL	N/A	(SAPCS NO):	N/A	ENG.G./DATE	CERTIFIED BY/DATE
TEMPERATURE:	NORMAL: 92 (33.33) °F (°C)	HEADS:	SHIPPING:	349,000 kg		CONST.AGENCY/DATE	OPERATION/DATE
	MAXIMUM: °F (°C)	- TYPE	EMPTY:	444,000 kg		BY/DATE	
SPECIFIC GRAVITY OF LIQUID:	HEAVY PHASE:1, LIGHT PHASE: 0.87	- BASE MATERIAL	SA 516 Gr. 70N HIC	OPERATING:	1,712,000 kg		
DATA SHEET TO BE COMPLETED IN ACCORDANCE WITH SAES-D-001.		- CLADDING OR OVERLAY	N/A	TEST:	2,560,000 kg		
VESSELS TO BE MANUFACTURED IN ACCORDANCE WITH 32-SAMS-004 & 01-SAMSS-016		FLANGES:	SA 350 Gr. LF2 Cl.1				
AND APPLICABLE ADDENDUM.		NOZZLE NECK (PIPE/PLATE/FORGE):	SA 106 GR. 52N/CL.1/SA 516 Gr. 70N HIC/SA 350 Gr. LF2 Cl.1	ACCESSORIES/ATTACHMENTS			
DESIGN CONDITIONS							
ASME DESIGN CODE & EDITION:	ASME SEC. VIII DIV. 1, 2021 ED. + U STAMP	INTERNAL ATTACHMENT CLIPS:	SA 516 Gr. 70N HIC	INLET DEVICE:	YES	0F1	5-Apr-23
INTERNAL PRESSURE:	110 (758.42) psig(kPa)	EXTERNAL ATTACHMENT CLIPS:	SA 516 Gr. 70N	CP ANODES BRACKET/CLIPS:	YES	0F2	10-Sep-23
EXTERNAL PRESSURE/TEMPERATURE:	7.5 (51.71) @ 300 (148.89) psig(kPa)/°F (°C)	STUD BOLTS:	SA-193 Gr. B7M	SLIDING ASSEMBLY:	YES		
INTERNAL TEMPERATURE:	200 (93.33) °F (°C)	NUTS:	SA-194 Gr. 2HM	PLATFORM & LADDER CLIPS:	YES		
M.D.M.T:	34 (1.11) °F (°C)	INTERNAL (DEMISTER & REMOVABLE):	S31803	INSULATION SUPPORTS:	N/A		
REINFORCEMENT:	Integrally reinforced openings	SUPPORT (SADDLE & PAD):	SA 516 Gr. 70N	MECHANICAL DATA SHEET FOR FIREPROOFING SUPPORTS:	N/A		
WIND:	PER SP-0000-13100-0002	SLIDING PLATE:	SA 36	LOW PRESSURE PRODUCTION TRAP LPPT (A81-D-0001, A82-D-0001)			
EARTHQUAKE:	PER SP-0000-13100-0001	BOLTS/NUTS (INTERNAL):	S31803	SADDLE STIFFENERS:	AS REQUIRED	ZULUF ONSHORE OIL FACILITIES	
CORROSION ALLOWANCE:	0.126 (3.2) in (mm)	FITTINGS (EXTERNAL):	N/A	NAMEPLATE W/ BRACKET:	YES		
RADIOGRAPHY:	PER CODE	GASKETS:	(Note 4)	NAMEPLATE/BRACKET:	YES	SAUDI ARABIA	
IMPACT TESTING (IT):	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> CODE	GROUNDING LUGS:	304 SS	PIPING SUPPORT W/CLIPS:	AS REQUIRED		
PWHT:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> SERVICE	VORTEX BREAKER:	SA 516 Gr. 70N HIC	PIPE SUPPORTS:	AS REQUIRED		
I. T. TEMPERATURE:	PER CODE / 32-SAMS-004	ANTI WAVE Baffles:	SA 516 Gr. 70N HIC	MANWAY LADDER RUNGS:	YES		
I. T. ENERGY AVE./MIN:	PER CODE / 32-SAMS-004	COALESCER PACKS/WEIRS (FUTURE):	S31803 / SA 516 Gr. 70N HIC	VACUUM STIFFENER RINGS:	AS REQUIRED		
				BAFFLES SUPPORTS:	YES		
				HEADERS SUPPORT CLIPS (FUTURE):	YES		
It is the responsibility of the contractor to ensure filling of this data sheet in compliance to the detailed company standard and material specifications							

LOW PRESSURE PRODUCTION TRAP LPPT  
(A81-D-0001, A82-D-0001)





DETAIL OF SHEAR KEY LUG  
(TO BE EMBEDDED IN THE FOUNDATION)  
(FOR FIXED SIDE ONLY)



REQUISITION NO:	R-2151-301-C
VENDOR:	MARITIME INDUSTRIAL SERVICES ARABIA CO. LTD

REVISION VALIDATION				
THIS REVISION NO OF2 IS COVERED, FOR ALL APPROVAL AND CERTIFICATION REQUIREMENTS, PER SAEP-334, UNDER DRAWING COMPLETION CERTIFICATION NO:				
DESIGN CERTIFICATION (DESIGN AGENCY)		REVIEW FOR KEY DRAWINGS <input checked="" type="checkbox"/> REQUIRED (SAUDI ARAMCO)		OTHER
ENGG./DATE	CERTIFIED BY/DATE	CONST.AGENCY/DATE	OPERATION/DATE	BY/DATE
S. SASAKI/ 07-Sep-23	K. OGAWA/ 07-Sep-23			
REV.NO.	DATE	ORIGINATOR	REVISION DESCRIPTION	
00	30-Nov-22	S.S	ISSUED FOR CONSTRUCTION	
0F1	5-Apr-23	S.S	ISSUED FOR CONSTRUCTION	
0F2	10-Sep-23	S.S	ISSUED FOR CONSTRUCTION	
JOB ORDER/EWO NO.		THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL CERTIFIED AND DATED		
10-08643-0005		SAUDI ARABIAN OIL COMPANY		
MECHANICAL DATA SHEET FOR LOW PRESSURE PRODUCTION TRAP LPPT (A81-D-0001, A82-D-0001) ZULUF ONSHORE OIL FACILITIES			DRAWING TYPE:	DAT
ZAFANAYA SAUDI ARABIA				
PLANT NO.	INDEX	DRAWING NUMBER	SHT. NO.	REV. NO.
A81	D	CD-553416-001	4 of 5	OF2
LOW PRESSURE PRODUCTION TRAP LPPT (A81-D-0001, A82-D-0001) DETAIL DRAWING				

**NOTES :**

- 1 The vendor is responsible for the equipment design and fabrication.
- Weights and thickness indicated are preliminary and shall be verified by vendor.
- 2 Deleted.
- 3 External painting and internal coating shall be as per SAES-H-001, SAES-H-101V, SS-0000-13A00-0001, and SS-0000-13A00-0003.

Parts	External Painting	Internal Coating
Vessel	APCS-11A	APCS-2E (All wetted CS internal surfaces)
Support	APCS-1D	-
Support under proofing	-	-

Vendor is responsible for internal coating application with full time inspection per specification SAES-H-001 and 175-091900 inspection requirements. Surface preparation shall be as recommended coating system. All welds shall be ground flush and sharp edges shall be removed and all corners shall be radiused. Vendor shall confirm suitability of APCS-2E for steam out condition.

4 Spiral wound gasket shall have 316 SS winding, graphite filler with 316 SS inner ring and CS outer ring.

5 Deleted.

6 Deleted.

7 Nozzle and manway bolt holes shall straddle vessel centerlines unless otherwise indicated.

8 Deleted.

9 Vendor shall design and fabricate vessel and lifting attachment for an impact factor of 2.0 min. considering erection weight.

10 Deleted.

11 All blind nozzles (including anode monitoring nozzle) and manways shall be complete with gasket, bolts and nuts.

12 Deleted.

13 All removable internals shall be designed and fabricated to pass through manway.

14 Deleted.

15 Deleted.

16 Deleted.

17 Deleted.

18 Vendor shall provide internal cathodic protection as per SAES-X-500 and AA-036388 / 89.

All metallic parts/devices installed inside the vessel whose material different from the vessel material shall be isolated from the body of the vessel.

A way of measuring electrical resistance with a megger tester has to be provided between the body of the vessel and each such internal part/device.

19 Equipment is in non-lethal and non-cyclic wet sour service region 2 and shall comply with NACE MR0175/ISO15156 with HIC requirements and NACE RP0472.

20 Deleted.

21 Deleted.

22 Deleted.

23 Deleted.

24 The LPPT shall be equipped with a submerged weir (for future installation). The weir shall be located at least one vessel diameter from the vessel tangent line on the side of outlet nozzles. The weir shall be supplied with provisions for future extension in height.

25 Deleted.

26 Demister pad to be fitted at vapour outlet of nozzle N4. Demister pad to be supplied and designed by vendor based on the following requirements (Early stage 2 % water cut summer case):

1) Bulk density lb/ft<sup>3</sup> = 4.99

2) Vapour density in lb/ft<sup>3</sup> = 0.321

3) Liquid Particle density in lb/ft<sup>3</sup> = 53.9

4) Liquid particle viscosity in cP = 2.20 (Max. 118)

5) Material of the wire mesh = S31803

6) Density of the wire mesh (lb/ft<sup>3</sup>) = by Vendor

7) Droplet size (micron) = greater than 6 microns

8) Vapour viscosity in cP = 0.011

Demister pad to minimize liquid carry over in the gas. Liquid carry over in gas shall be less than 0.1 gal/MMSCF. Demister pad sizing and calculation shall be submitted for approval.

Demister pad and support grids shall be removable to pass through manway.

27 Vendor shall perform computational fluid dynamic (CFD) modeling to demonstrate the separation efficiency of the selected vessel internals. CFD analysis shall demonstrate the required product stream specifications are specifications are achieved by the proposed vessel internals based on the process stream data provided.

**NOTES (Cont.):**

- 28 All internals shall be trial fitted inside the vessel at vendor shop under the supervision of internals manufacturer on a full-time basis during fabrication. Necessary isolation between dissimilar materials (such as carbon steel and stainless steel) shall be maintained which shall be tested using megger testing.
- 29 Bolting for inlet device and supporting frame shall use locknuts or double nuts with tack weld to avoid loosening due to the dynamic loads from the slugs. Bolting arrangement shall be reviewed and concurred by Aramco.
- 30 Vendor shall provide supports for two internal coalescers for future installation. Support shall be suitable for selected coalescer pack meeting performance requirements.
- 31 Perforated (not Slotted) Anti-Wave baffles shall be provided.
- 32 Vendor shall mechanically design the process vane type inlet deflector device considering the inlet nozzle fluid force to be pu2: 3806 lb/(ft<sup>2</sup>) and confirm the size of the Feed Inlet Nozzle (N1).
- The inlet nozzle shall be 6" (min.) above high high liquid level (HHLL) to avoid liquid re-entrainment.

33 Deleted.

34 Deleted.

35 Deleted.

36 Turn down flow rate is 40%.

37 LPPT process stream properties:

Parameters	Units	Summer 36%	Winter 36%
Operating Pressure	psig	50	50
Operating Temperature	°F	92.1	59.3
Gas Feed Flow	lb/hr	238000	209600
Gas Density	lb/ft <sup>3</sup>	0.271	0.270
Gas Viscosity	cP	0.011	0.011
Oil Feed Flow	lb/hr	4205000	4240000
Oil Volumetric Flow (actual)	MEPD	329.5	328.2
Oil Density	lb/ft <sup>3</sup>	54.53	55.24
Oil Viscosity	cP	12.4	17.68
Oil Surface Tension	dynes/cm	24.12	25.05
Water Feed Flow	lb/hr	2732000	2761000
Water Volumetric Flow (actual)	MEPD	186.8	186.2
Water Density	lb/ft <sup>3</sup>	62.5	63.35
Water Viscosity	cP	0.742	1.13
Water Surface Tension	dynes/cm	70.64	73.79

38 Vendor shall provide suitable vessel internals (e.g. coalescence packing) to guarantee adequate separation of oil, gas, and water as per the streams provided in the above table.

39 Three phase Production Traps shall be designed to separate oil droplets of 200 microns and larger at Normal Interface Level (NIL) from water continuous phase and have minimum 5 minutes water retention time.

40 The nozzles for the interface level instruments shall be located close to the water weir. Whenever possible, the nozzles for the interface level instruments shall not be taken from the bottom of the vessel. However, when used, bottom vessel connections shall include an internal nozzle extension to reduce bottom solids from entering the standpipe.

41 The nozzles for the oil level instruments shall be located into the oil collection compartment. Whenever possible, the nozzles for the oil level instruments shall not be taken from the bottom of the vessel. However, when used, bottom vessel connections shall include an internal nozzle extension to reduce bottom solids from entering the standpipe.

42 Spare interface level connection shall be installed for future expansion of interface level range.

43 Vendor shall recommend control and safety instrumentation for safe operation.

44 Level instruments nozzles shall not be located at bottom of the vessel unless necessary.

45 Summer 36% water cut and winter 36% water cut are the design basis for vessel sizing and weir overflow design.

46 Longitudinal seam of thick stroke at saddles shall be fully radiographed.

47 Steam out nozzle and vent shall be as far apart as possible to allow steam sweeping through the vessel.

48 Vendor shall provide jetting water system for LPPT to remove solids (for future installation).

49 Deleted.

50 All dimensions are in millimeters (mm), unless otherwise indicated.

51 Deleted.

52 Vessel is subject to steam-out condition and shall be designed for an external pressure of 7.5 psi @ 300 °F.

53 Deleted.

54 Deleted.

55 Special Service:

Lethal: No      Wet Sour: Yes      Amine: No      Cyclic: No

Caustic: No

H2: No

Utility: No

56 Nozzle size and quantity to be confirmed by vendor.

Parameters	Units	Value (36% Winter)
Liquid Mass Flow Rate	lb/hr	6933730
Liquid Density	lb/ft <sup>3</sup>	57.4
Vapor Mass Flow Rate	lb/hr	237887
Vapor Density	lb/ft <sup>3</sup>	0.271
Density for Slug Force Calc.	lb/ft <sup>3</sup>	57.4

**APPLICABLE SPECIFICATIONS AND STANDARDS**

Following specifications, standards and drawings are shall be considered as minimum, but not limited to:

**Project Specifications:**

PE-30003	Specification for Pressure Vessels
CE-557203-001	Supplementary Specification for Safety Identification and Safety Colors
(SS-0000-13A00-0002)	

**Saudi Aramco Materials System Specifications**

01-SAMSS-016	Qualification of Plates for Pressured Equipment and Storage Tanks
02-SAMSS-011	Forged Steel and Alloy Flanges

17-SAMSS-006	Galvanic Anodes for Cathodic Protection
17-SAMSS-008	Junction Boxes for Cathodic Protection

32-SAMSS-004	Manufacture of Pressure Vessels
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**Saudi\_Aramco\_Engineering\_Standards**

SAES-A-112	Meteorological and Seismic Design Data
SAES-A-202	Saudi Aramco Engineering Drawing Preparation

SAES-A-206	Positive Material Identification
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SAES-H-001	Coating Selection and Application Requirements for Industrial Plants and Equipment
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SAES-H-101V	Approved Saudi Aramco Data Sheets – Paints and Coatings
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SAES-J-100	Process Measurement
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SAES-M-001	Structural Design Criteria for Non-Building Structures
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SAES-N-001	Basic Criteria, Industrial Insulation
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SAES-W-010	Welding Requirements for Pressure Vessels
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SAES-X-500	Cathodic Protection of Vessel and Tank Internals
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**Standard\_Drawings**

CD-553389-001	Standard Drawing for Pipe Support Lug
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(DB-0000-13410-0004)	Standard Drawing for Nameplate for Pressure Vessel
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CD-553391-001	Standard Drawing for Wire Mesh Blanket Support- VBR
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(DB-0000-13510-0006)	Standard Drawing for Foundation Plan/ Layout/ Sect/ Det PJ Standard Anchor Bolt
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(DB-0000-13200-0003)	Vessel/ S&T Heat Exchanger Standard Details (Metric Units)
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REQUISITION NO: R-2151-301-C  
VENDOR: MARITIME INDUSTRIAL SERVICES ARABIA CO. LTD

**REVISION VALIDATION**

THIS REVISION NO OF2 IS COVERED, FOR ALL APPROVAL AND CERTIFICATION REQUIREMENTS, PER SAEP-334, UNDER DRAWING COMPLETION CERTIFICATION NO:

DESIGN CERTIFICATION (DESIGN AGENCY)	CERTIFIED BY/DATE	CONST.AGENCY/DATE	OPERATION/DATE	BY/DATE
ENG.G./DATE	CERTIFIED BY/DATE	CONST.AGENCY/DATE	OPERATION/DATE	BY/DATE

S. SASAKI/ 07-Sep-23	K. OGAWA/ 07-Sep-23	REVISION DESCRIPTION
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REV.NO.	DATE	ORIGINATOR	REVISION DESCRIPTION
00	30-Nov-22	S.S	ISSUED FOR CONSTRUCTION
0F1	5-Apr-23	S.S	ISSUED FOR CONSTRUCTION
0F2	10-Sep-23	S.S	ISSUED FOR CONSTRUCTION

JOB ORDER/EWO NO. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL CERTIFIED AND DATED 10-08643-0005

**SAUDI ARABIAN OIL COMPANY**

MECHANICAL DATA SHEET FOR	DRAWING TYPE:	DAT
LOW PRESSURE PRODUCTION TRAP LPPT (A81-D-0001, A82-D-0001)		

ZULUF ONSHORE OIL FACILITIES	SAUDI ARABIA
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ZAFANIYA	SHT. NO.	REV. NO.
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A81	D	CD-553416-001
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5 of 5	OF2
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**LOW PRESSURE PRODUCTION TRAP LPPT**

(A81-D-0001, A82-D-0001)

**GENERAL NOTES**